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CORRECTIVE MEASURES IMPLEMENTATION PLAN, DIXON TICONDEROGA FACILITY, DEER LAKE, PA.

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1.0 INTRODUCTION

1.1 Purpose

1.1.1 Project Background

The Dixon Ticonderoga (Formerly Dixon Wearever) Facility is located on Route 61 in West Brunswick Township, Schuylkill County, Pennsylvania (Figure 1). Dixon's operations at this Facility include the manufacturing and assembling of writing instruments. The facility was previously owned and operated by David Kahn Incorporated (DKI) from 1964 to 1987. Dixon, the present owner, purchased the facility in 1987 and has continued to operate the Facility since that time.

In 1985, pursuant to the Pennsylvania's hazardous waste management regulations, DKI closed two concrete lined evaporation lagoons. According to the closure plan approved by Pennsylvania Department of Environmental Resources (PaDER), all waste water and sludge stored in the lagoons was removed and transported to an off-site facility for proper disposal. The lagoons were then backfilled with clean fill and covered with an impermeable liner, covered with soil, graded and seeded. The two lagoons had been used to treat and store ink and metal sludge generated during the Facility's manufacturing process. The first lagoon was constructed in 1967. The second lagoon was constructed in 1980 to contain overflow from the first lagoon.

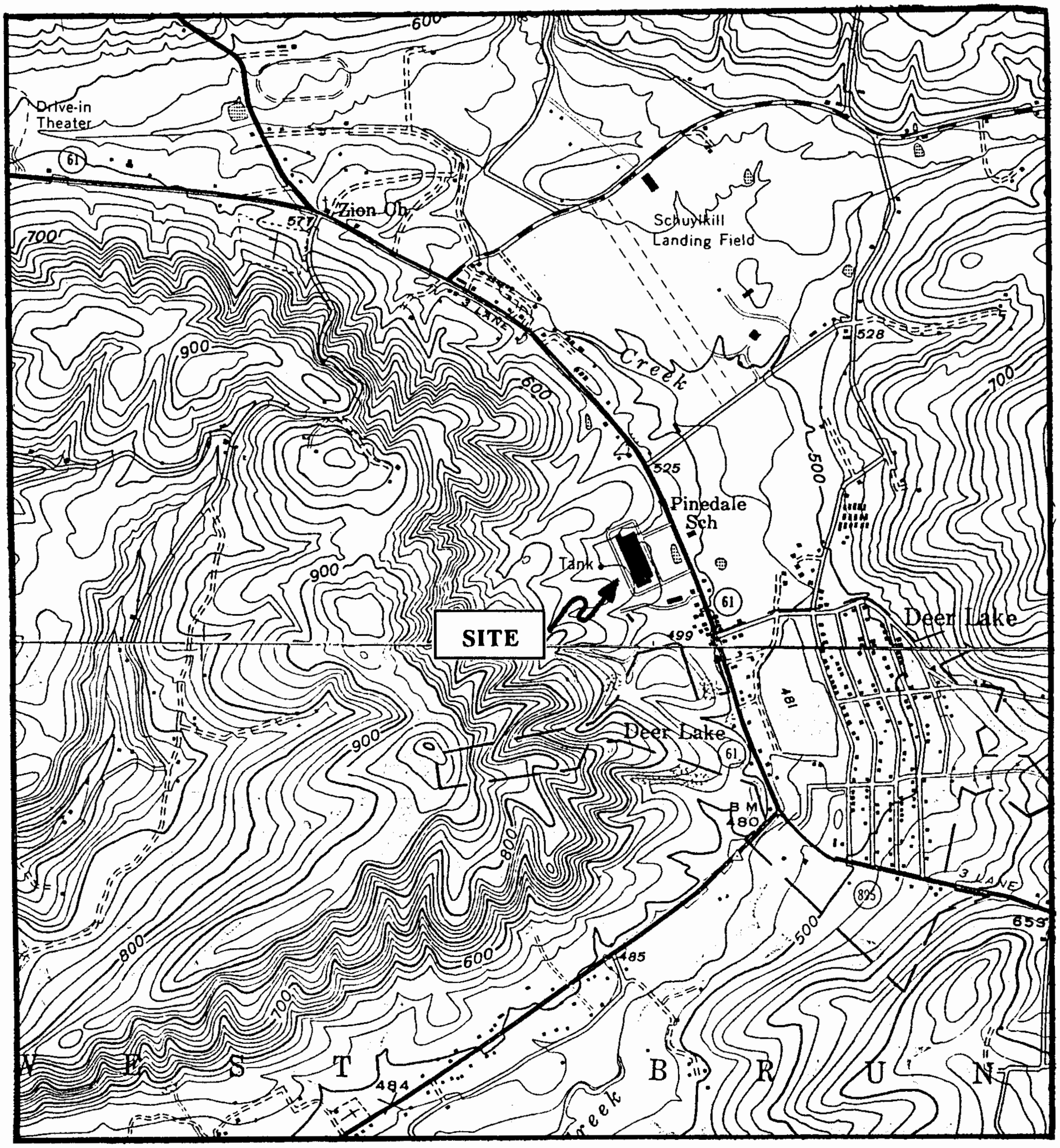
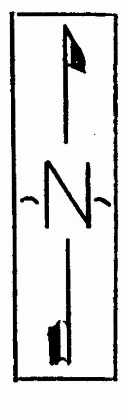


FIGURE 1: LOCATION MAP, DIXON TICONDEROGA FACILITY, DEER LAKE, PENNSYLVANIA

Portions of the Orwigsburg and Auburn 7.5' Quadrangle

2,000 ft.



In 1985, as part of the PaDER approved lagoon closure plan and in order to fulfill groundwater monitoring requirements, DKI installed, sampled and analyzed five groundwater monitoring wells, one upgradient and 4 downgradient of the area surrounding the two lagoons (Exhibit I). Additionally, the facility production well was sampled as part the PaDER monitoring requirements. Dixon continues to sample and analyze the groundwater on a quarterly basis. The 1985 analyses of the groundwater samples detected 1,1 dichloroethane (1,1 DCA), 1,2 dichloroethylene (1,1 DCE), 1,1,1 trichloroethane (1,1,1 TCA), trichloroethylene (TCE), and lead in the monitoring wells and production well.

In 1988 the U.S. Environmental Protection Agency (EPA) performed a RCRA Facility Assessment (RFA) at the Dixon Facility. The RFA assessed the possible sources of contamination of the above mentioned lagoons and other areas of concern at the Facility. Listed below is a summary of the areas of concern in the RFA (refer to Exhibit I for the locations of these areas):

1) A wastewater effluent lagoon used to treat effluent from an on-site sewage treatment plant and effluent from the metal plating solution treatment operation located in the ink waste storage building (Exhibit I). The sewage treatment plant wastewater was last received by the lagoon in 1986, and water from the metal planting operation was last received in 1981.

2) A gravity sand oil trap (Area 15 on Exhibit I) previously used to process oil generated from scrap metal processing at the Facility. This unit ceased processing oil in 1986. Boiler and cooling blow down water at the Facility are still passed through the trap prior to release through a permitted Clean Water Act National Pollutant Discharge Elimination System (NPDES) outfall to Pine Creek.

3) A drum storage area (Area 13 on Exhibit I) used to store empty alcohol and lacquer drums.

4) Three discrete on-site areas of manufacturing waste (Areas 1, 4, and 7 on Exhibit I) used to dispose of burned and unused pen parts.

5) An active 20,000 gallon underground fuel oil storage tank (Area 12 on Exhibit I).

Pursuant to a 1988 Administrative Consent Order (ACO) and in order to stabilize the areas of environmental concern, Dixon implemented the following interim measures under EPA's approval:

In February 1988, EPA and PaDER required Dixon to stop using groundwater from the production well as a source for the Facility's drinking water. Dixon provided bottled water until a groundwater treatment system could be installed. By August 1990, Dixon had installed a stripping tower. When stripping tower effluent was within acceptable drinking water standards, bottled water was discontinued.

In December 1988, Dixon implemented the requirements listed in the closure plan for the wastewater effluent lagoon by removing all contaminated sludge and installing groundwater monitoring wells that would serve the dual purpose of monitoring the lagoons and as a well cluster for the RFI. Final implementation of the closure plan, which includes backfilling of the excavated area, is pending PaDER approval. Final implementation of the closure plan will be initiated as a requirement of the 1988 ACO.

In March of 1989 the underground fuel oil storage tank (Area 12) was tested and failed a leak detection test. The tank was tested by Dixon under an EPA-approved plan submitted as part of the 1988 ACO. The tank was emptied, cleaned, and removed in accordance with the EPA-approved closure plan. The soil in the excavation was excavated to 100 parts per million ("ppm") total petroleum hydrocarbons. The excavated soil was staged and covered with plastic and is currently being stored on-site pending corrective action. This soil will undergo on-site bioremediation treatment starting in August of 1993. It will be sampled and analyzed, according to the approved work plan, prior to cessation of the bio-remediation program.

Areas 1, 4, and 7 (Exhibit I) exhibited elevated concentrations of trichlorethylene, ethylbenzene, arsenic, barium, cadmium, chromium, lead, mercury, and silver. In April 1991 approximately 113 tons of soil and debris were excavated from Areas 4 and 7 and removed to an off-site disposal Facility according to an EPA-approved removal plan.

Confirmation sampling revealed that there was still one portion of Area 7 and Area 1 where the levels of arsenic in the soil was still of concern to the EPA because the arsenic level was above background and above EPA action level for arsenic in soil. Area 7 contained approximately 12.25 cubic yards of arsenic impacted soil and Area 1 contained approximately 13 cubic yards of arsenic impacted soil. Table 1 lists the levels of arsenic present in Area 1 and Area 7 compared to EPA's action levels and background concentrations for arsenic in soil (All concentration values are in ppm).

TABLE 1
ARSENIC CONCENTRATIONS IN AREAS 1 AND 7
AFTER INITIAL SOIL AND DEBRIS REMOVAL

Arsenic Concentration		EPA Action Level	Background Concentration
Area 1	Area 7		
15	37	1.6	5.54 - 15.0

Due to the limited amount of impacted soil, excavation, removal, and off-site-disposal in accordance with RCRA regulations was considered to be the most efficient, rapid and cost effective corrective measure to address this situation. This method would also provide immediate remediation with minimal generation of waste. In April of 1993 Area 1 and Area 7 were excavated to below the Facility background concentration for arsenic by Dixon pursuant to the requirements of the 1988 ACO. Excavated soil was staged and scheduled for off-site disposal in August of 1993.

Based on the soil samples taken during the RFI, EPA has determined that no corrective measures are necessary at the drum storage area (Area 13) and the sand oil trap area (Area 15). However, the sand and gravel in the oil trays will be bioremediated on site along with the soils from Areas 11 and 12. This is necessary because the material collected oil after a spill by a contractor who was installing a new oil tank.

In 1989, Dixon begun implementation of a RCRA Facility Investigation (RFI) in accordance with an EPA approval work plan.

As part of the RFI Dixon installed additional monitoring wells at the Facility. These wells are labeled monitoring wells 3D, 8D, 8I, 8S, 9S, and 10S on Exhibit I.

Based on hydraulic testing of the aquifer beneath the site there appears to be wide lateral variability in permeability. Beneath the site there are three zones of pMwmeability: (1) a shallow unconfined zone extending to a depth of approximately 100 feet below the ground surface; (2) underlying the shallow zone, a lower-permeability intermediate zone from approximately 100-150 feet below the ground surface; and (3) a deeper zone encountered below a depth of 150 feet.

The deeper aquifer yields substantial amounts of water and is used as a on-site drinking and production water supply source through the production well at the Facility. The production well is 400 feet deep intercepts all three zones. The general direction of the groundwater flow beneath the Facility is east.

Based on the findings of RFI, compounds of concern in the groundwater are 1,1 dichloroethane, 1,2 dichlorothylene, 1,1,1 trichloroethane, 1,1 dichloroethylene and trichloroethylene. The shallower portions of the water bearing zones contain the highest levels of volatiles with lesser concentrations found at greater depths. Volatile organics detected in monitoring wells from the May 1990 RFI sampling event are listed in Table 2 (all concentration values are in ug/l).

TABLE 2

VOLATILE ORGANIC COMPOUNDS DETECTED

IN DIXON MONITORING WELLS, MAY 1990

WELL	COMPOUND	CONCENTRATION ug/l
1S	1,1 dichloroethane trichloroethylene	2.81 1.72
2S	1,1 dichloroethane 1,1,1 trichloroethane trichloroethylene	4.39 2.36 4.12
3S	1,1 dichloroethane 1,1,1 trichloroethane 1,1 dichloroethylene trichloroethylene	3.1 42.80 3.16 22.30
3D	1,1 dichloroethane 1,1,1 trichloroethane 1,1 dichloroethylene	4.28 49.40 1.62
4S	None detected	
5S	1,1,1 trichloroethane 1,1 dichloroethylene trichloroethylene	18.30 0.72 2.62
8S	1,1,1 trichloroethane 1,1 dichloroethylene trichloroethylene	57.30 2.16 24.30
8I	None detected	
8D	None detected	
9S	None detected	
10S	1,1,1 trichloroethane	2.82

The two closed evaporations lagoons discussed above have been determined to be the only sources of the volatiles in the groundwater. However, as previously stated, these lagoons have been closed according to a PaDER approved closure plan. The sludges have been removed and the area was backfilled and capped to eliminate the potential for any more volatile organics to leach into the groundwater. The sludge removal and capping of these lagoons stopped any further leaching.

On January 10, 1990, in order to determine the extent of volatile organics in the groundwater Dixon tested 29 off-site downgradient residential wells. Volatile organics were detected in three wells at levels below EPA drinking water standards as set forth in the 40 C.F.R. Part 141, Subpart B. The compounds detected were tetrachloroethylene, 1,1,1 trichloroethane, trichloroethylene, ethylbenzene, xylene, benzene, toluene. Benzene, toluene, ethylbenzene, and xylene have not been detected in the on-site groundwater monitoring wells and are not attributed to the Dixon Facility. Tetrachloroethylene has also not been found in the groundwater at Dixon and is not believed to have originated there.

The RFI also included a baseline risk assessment which evaluated the carcinogens and non-carcinogens risk associated with contact with the volatiles in the groundwater and the metals in the soil. Also included in the risk assessment was a fate and transport study and subsequent risk calculation to address the possibility of metals leaching from the soil into the groundwater. The RFI report was conditionally approved by EPA in October 1991, pending minor revisions.

In February of 1992, Dixon submitted to EPA a Corrective Measures Study (CMS) outlining proposed action for remediation of the site. The CMS proposed the use of the existing production well and air stripper, with a modified pumping schedule, for remediation of the groundwater. The CMS also proposed excavation of soil from Area 7 to eliminate elevated concentrations of metals. In October of 1992, the EPA issued its Final decision and Response to Comments (FDRTC). The FDRTC approved the CMS with the conditions that monitoring Well #5 be used as an additional groundwater recovery well and that soil and debris with elevated metals content be removed from Area 1.

In July of 1993, EPA issued to Dixon a Corrective Action Order, incorporating the Corrective Measures Implementation (CMI) into the 1988 ACO. The Corrective Action Order required Dixon to prepare and submit a Corrective Measures Implementation (CMI) plan. A copy of the July 1993 order is contained in Appendix I.

1.1.2 Purpose of CMI Plan

The purpose of this CMI plan is to outline and describe in detail the procedures and designs to be used to implement, maintain and monitor the recommended remedial alternatives proposed in the CMS and approved in the FDRTC.

1.2. Corrective Measures Objectives

The objectives of the Corrective Measures Implementation are as follows:

Groundwater: Conduct groundwater recovery and treatment at the production well and monitoring Well #5 to attempt to reduce volatile organics in the groundwater on-site to concentrations at or below the clean up standards set in the FDRTC.

Soil: To document the removal actions that have already been completed. To remediate concentrations of metals in Areas 1 and 7 to within site background concentrations.

1.3 Conceptual Model of VOC Migration

The distribution of volatile organics in the groundwater is illustrated in Exhibit II. The migration pathway of the volatile organics can be described as follows:

1. The source area of the volatiles is the closed evaporation lagoons. Residual volatiles may be absorbed to soil or bedrock fractions above the water table and gradually transported to the groundwater during periods of high infiltration from the ground surface. Volatiles may also be washed from the unsaturated zone during periods when the water table rises to higher-than-normal levels.

Volatiles in the shallow saturated zone in the vicinity of the lagoons probably do not migrate very rapidly, because the permeability of this zone is low.

2. The volatiles become dissolved in the groundwater and begin to flow eastward in response to the hydraulic gradient. The plume of volatiles in the groundwater is relatively narrow and appears to be mostly limited to an east-west trending fracture zone passing more-or-less through the Well #8 cluster. Elevated concentrations of volatiles are limited to the shallow portion of the saturated zone since deeper monitoring wells have not indicated the presence of volatiles or have shown very low concentrations of volatiles.

3. The production well significantly influences groundwater flow, and therefore migration of volatiles, on the site. The influence of the production well on the plume is evident in Exhibit II, which illustrates its distortional effect on flow paths and its tendency to draw in volatiles. The production well typically contains the highest concentrations of volatiles in any well on-site.

The production well also has a tendency to reverse the natural hydraulic gradient and draw volatiles back toward the source area. Monitoring has shown that the production well causes drawdown of up to 3 feet in shallow monitoring wells at the downgradient property boundary.

4. Volatile organics have been detected in the groundwater beyond the downgradient property boundary (across Route 61). However, they are not present in concentrations above Federal Drinking Water Standards or above the Cleanup Standards set in the FDRTC. It is probable that the production well has prevented the migration of volatiles across Route 61 in high concentrations.

2.0 DESIGN PLANS

2.1 Description of Corrective Measure

2.1.1 Soil

Corrective action for the soil in Areas 1 and 7 took place on April 15, 1993. The approximate areas of impacted soil were marked out with stakes and survey tape. The soil was then excavated and staged on polyethylene sheeting. After excavation, one 5 point composite verification sample was collected from each area and sent to a laboratory for analysis for heavy metals. The analysis results from Area 7 indicated that the soil had been remediated to within site background levels for metals. The analysis results from Area 1 indicated that elevated concentrations of arsenic still existed. Therefore, on May 11, 1993 the Area 1 excavation was divided into 6 sub-areas and 5 point composite samples were collected from each sub-area. The 6 samples were analyzed for lead and arsenic and none was detected above background concentrations. It was judged that the elevated arsenic concentration in the April 15 sample was from an extremely small area. Since the more detailed sampling of May 11 is considered more representative of actual conditions, Area 1 was deemed to be adequately remediated.

The excavated soil from Areas 1 and 7 was characterized to be non-hazardous based on sample analysis. The soil was scheduled to be transported to Wayne Disposal in Michigan in August of 1993.

Analytical results from Areas 1 and 7 are contained in Appendix II. Upon removal of the soil from the site, Areas 1 and 7 will be considered clean. The shallow excavation at Area 1 will be graded with clean fill. They will be addressed no further in this CMI.

Soil from Areas 11 and 12 will be treated on site through biodegradation, beginning in August of 1993. A copy of the approved bioremediation plan is contained in Appendix III.

2.1.2 Groundwater

Remediation of the groundwater will be undertaken using a pump and treat approach. The production well and Well #5 will be used as groundwater recovery points. Groundwater withdrawn from the wells will be treated and discharged to Pine Creek via an existing effluent pipe.

The production well will be retrofitted with a new pump and controls to allow it and its associated air stripper to be utilized as a more efficient and effective recovery well. A granular activated carbon (GAC) treatment system will be constructed at Well #5 to treat water removed from that well.

It is anticipated that, at least initially, the two wells would operate on a staggered schedule with the production well being the primary recovery point and Well #5 operating during periods when the production well is dormant. As the remediation program progresses, it is possible that the two wells will be pumped simultaneously, or that Well 5 will be shut down sooner than the production well.

A network of surrounding monitor wells will be sampled on a periodic basis in order to track the progress of remediation activities.

All of the above described tasks are detailed in the remainder of this CMI plan.

2.2 Data Sufficiency

The following site specific data is necessary in order to properly design a groundwater remediation program for the Dixon site:

- delineation of the volatiles plume in the groundwater, both laterally and vertically.

- quantitative analytical data on the types and concentrations of compounds to be remediated.
- hydraulic and hydrogeologic data on the site, including pumping capabilities and areas of influence of recovery wells.

All of the above required data was obtained during the RFI and previous investigations, as well as during the CMS, and is available for use in the CMI.

The plume of volatiles in the groundwater was defined both laterally and vertically during the RFI. Monitoring wells distributed across the site were used to define the lateral extent of the plume. Shallow/deep well pairs or well nests were used to delineate the vertical extent of the plume. A graphical representative of the plume is shown in Exhibit II.

A large amount of quantitative analytical data is available on the types and concentrations of organic compounds in the groundwater. Quarterly analytical data exists for 5 on-site monitoring wells and the production well from 1985 to the present. Additional groundwater quality data was collected for all on-site monitoring wells during the RFI. The data available includes well #5 and the production well, which will be used as groundwater recovery wells.

Site specific hydrogeologic and hydraulic data was collected during the RFI and CMS, as well as during earlier investigations. A pumping test on the production well in 1985 helped to define its area of influence. Longer term monitoring of water levels in monitoring wells during the CMS phase confirmed the production wells area of influence and the magnitude of drawdown it causes around various portions of the site. This data is reproduced graphically in Appendix IV. Well #5 was subjected to a pumping test when it was installed in 1985 and again during the RFI. The hydraulic characteristics of all the on-site monitoring wells were determined during the RFI, either through pumping tests or piezometer tests.

This data confirms that the production well has a sufficient area of influence to serve as the primary recovery well. It is capable of causing drawdown on all portions of the site, including the downgradient property boundary, where volatiles have been detected in the groundwater. Well #5 has a smaller area of influence but it does have an adequate yield to allow it to be used as a secondary recovery well and gradient reversal well. The actual pumping rates and pumping schedules of the production well and Well #5 will require monitoring and modification during the initial weeks of operation. However, all other information is available for the purposes of design and implementation of a groundwater remediation system.

2.3 Production Well

2.3.1 Design Criteria

In order not to jeopardize the existing water supply permit, water from Well 5 and the production well will not be mixed. Each system will stand alone and discharge into the sewer lines to the discharge wet well located at the south end of the former polishing lagoon.

Treatment standards for compounds found in Dixon's wells as required by the FDRTC are:

Compounds	Standard (ppb)
1,1-DCA	810 10
1,1-DCE	7 MCL
1,2-DCE	70 MCL
1,1,1-TCA	200
TCE	5

2.3.2 Existing Facilities

The mechanical facilities (air stripping tower for treatment of well water) to accomplish the groundwater plume containment and groundwater clean up presently exist on site to remove volatile organics to the above standards.

1. General Description of the Existing Production Well Treatment Scheme

Well water is pumped directly from the well at a rate of 100 to 120 ppm to the top of the stripping tower. An air blower pumps air into the bottom of the air stripper and air flows upwards and countercurrent to the water flow. Treated water flows into the sump located at the bottom of the air stripper. Air containing volatiles exits the top of the tower without collection as permitted by PaDER; refer to attached PaDER Form ER-AQ-17, dated July 23, 1992.

A centrifugal pump pumps the treated water from the sump to the top of the 400,000 gallon plant storage tank. Water in excess of plant needs will be discharged into the effluent line ~~from the sanitary~~ sewer sewage treatment plant. Refer to Figure 2 entitled "Existing and Proposed Discharge Piping". Use of water by the plant reduces amount of water that must be discharged.

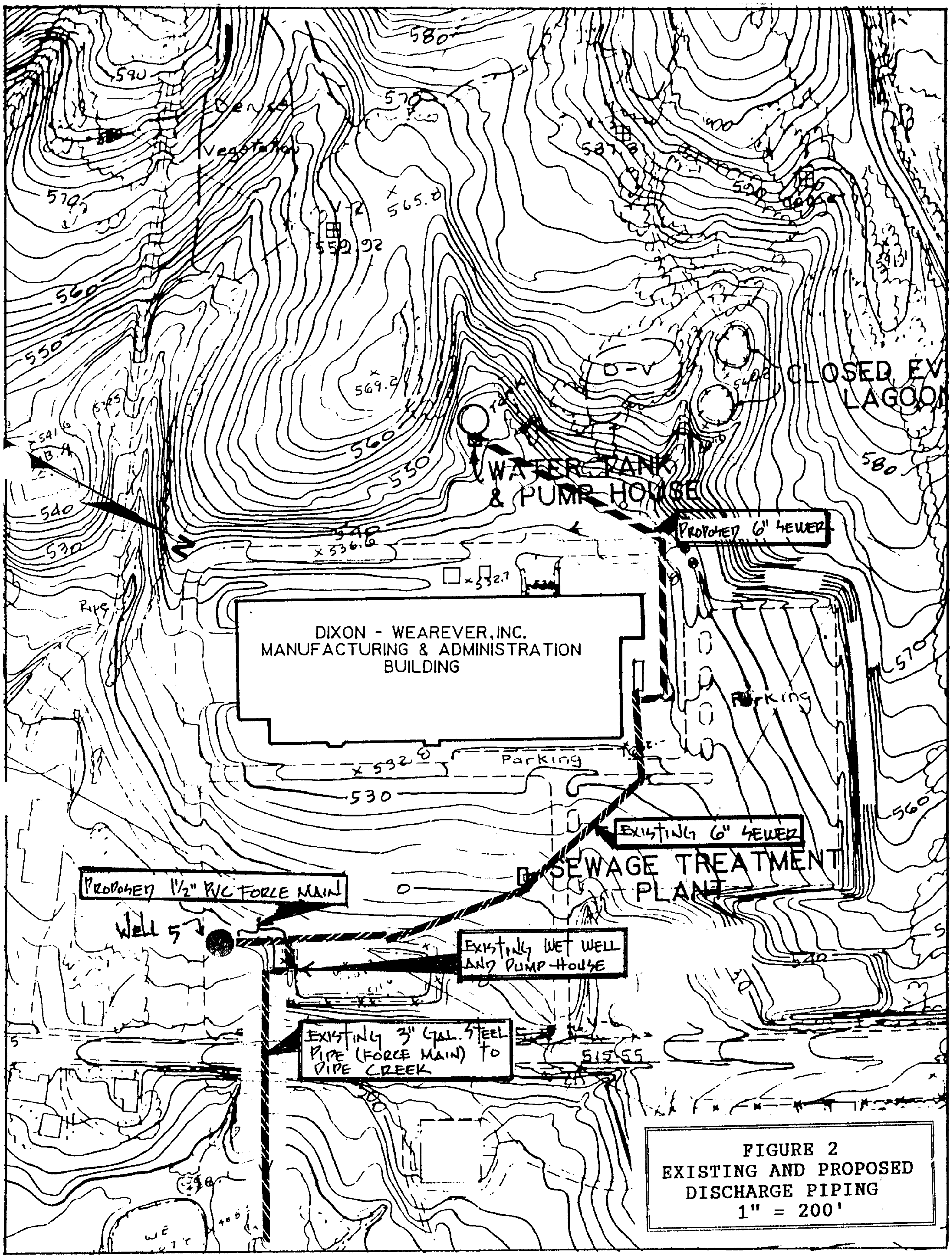
2. Existing Stripping Tower Specifications

Make:

- Delta Cooling Towers

Specifications:

- Air flow indicates reduction or loss in air flow to indicate fouling of packing, loose belts, or motor failure
- Water level control package
- Control panel starts booster pump and blower, shuts down system on loss of air flow
- Maximum water flow = 150 GPM
- Minimum water flow = 5 GPM
- Total tower height = 15.25 feet


CLOSED EV
LAGOON
WATER TANK
& PUMP HOUSE
PROPOSED 6" SEWER
DIXON - WEAREVER, INC.
MANUFACTURING & ADMINISTRATION
BUILDING
Parking
Parking
EXISTING 6" SEWER
SEWAGE TREATMENT
PLANT
PROPOSED 1½" PVC FORCE MAIN
WELL 5
EXISTING WET WELL
AND PUMP HOUSE
EXISTING 3" GAL. STEEL
PIPE (FORCE MAIN) TO
PIPE CREEK
Vegetation
Pipe
565.8
569.2
552.92
515.55
590
580
570
560
550
540
530
FIGURE 2
EXISTING AND PROPOSED
DISCHARGE PIPING
1" = 200'

- Height of packing = 9.5 feet
- Stripper diameter = 3 feet
- Stripper construction: polyethylene resin
- Type of packing: modular polyethylene packing
- Size of air blower: 2HP, 1800 RPM
- Blower capacity: 4600 SCFM
- Surface area of packing: 90 sq.ft./cu.ft.
- Void space: greater than 98%

3. Design Changes - Production/Well Stripping Tower

The existing water supply (production) well at Dixon's Deer Lake Facility is an 8 inch diameter open rock bore hole, 400 feet in depth, cased to 43 feet with an 8 inch steel casing.

The present well pump is a Peerless line shaft turbine pump capable of pumping 120 gpm against a 218 foot head. Pump motor is 10 horsepower, 440 volt, 60 hertz. The pump was purchased in January 1967. The packing chamber at ground level is leaking and needs repacking. The column (contains pump shaft and discharge pipe) is 4 inch inside diameter; there are couplings, probably every 10 feet of length, to the pump turbines located 200 feet below grade. These couplings have a 5 inch 3/32 inch outside diameter. Since the well is an 8 inch open rock well, that leaves only 1 inch 14/32 inches of space in the annulus for installation of a 1½ inch diameter pressure transducer.

Because of the limited pump life expectancy and the difficulty of installing a reliable well water level monitor, this pump will be replaced with a new submersible turbine pump capable of discharging 120 gpm against a total discharge head of 218 feet.

Existing wellhouse piping will be modified as follows:

a. A transducer will be mounted in the 400,000 gallon storage tank to monitor tank level and to open or close tank bypass line. See electrically operated valve discussion below.

b. An electrically operated valve will be installed on the line from the stripping tower. This normally closed valve will be electrically opened if the storage tank is full. This will allow discharge of unchlorinated water to the Pine Creek as the chlorination line to the tank will be shut down when this valve is open.

c. The existing well pump will be removed and a new submersible pump will be installed along with a transducer in the well. Well level will be recorded so that the optimum pumping level can be determined.

d. A water meter will be installed on the influent line to the air stripping tower.

These changes are shown on the drawing entitled "Domestic Water Treatment and Distribution Schematic" (Figure 3).

2.3.3 Performance Levels

Removal Performance/Reliability of Existing Tower:

The existing stripping tower has been in service since February, 1990. Chemical tests taken to assure potable water have demonstrated the removal capability of the existing equipment. Periodic testing of the water treated by the air stripper will be required to assure that the water discharged will meet NPDES limits and SOB. The latest analysis, dated May 19, 1993, follows:

IDENTIFICATION: AIR STRIPPING TOWER EFFLUENT

ORGANIC VOLATILES	RESULT	UNIT	DATE	PROCEDURE	
1,1,1-Trichloroethane	<0.0005	mg/l	05/28	EPA 502.2	DKB
1,1-Dichloroethylene	<0.0005	mg/l	05/28	EPAMw502.2	DKB
1,2-Dichloroethane	<0.0005	mg/l	05/28	EPA 502.2	DKB
1,4-Dichlorobenzene*	<0.0005	mg/l	05/28	EPA 502.2	DKB
Benzene*	<0.0005	mg/l	05/28	EPA 502.2	DKB
Carbon Tetrachloride*	<0.0005	mg/l	05/28	EPA 502.2	DKB
Trichloroethylene	<0.0005	mg/l	05/28	EPA 502.2	DKB
Vinyl Chloride	<0.0005	mg/l	05/28	EPA 502.2	DKB

*These compounds have not been found in Dixon's Deer Lake plant groundwater. Tests for these compounds were run to ascertain that they are not present and to comply with the requirements of the water supply permit.

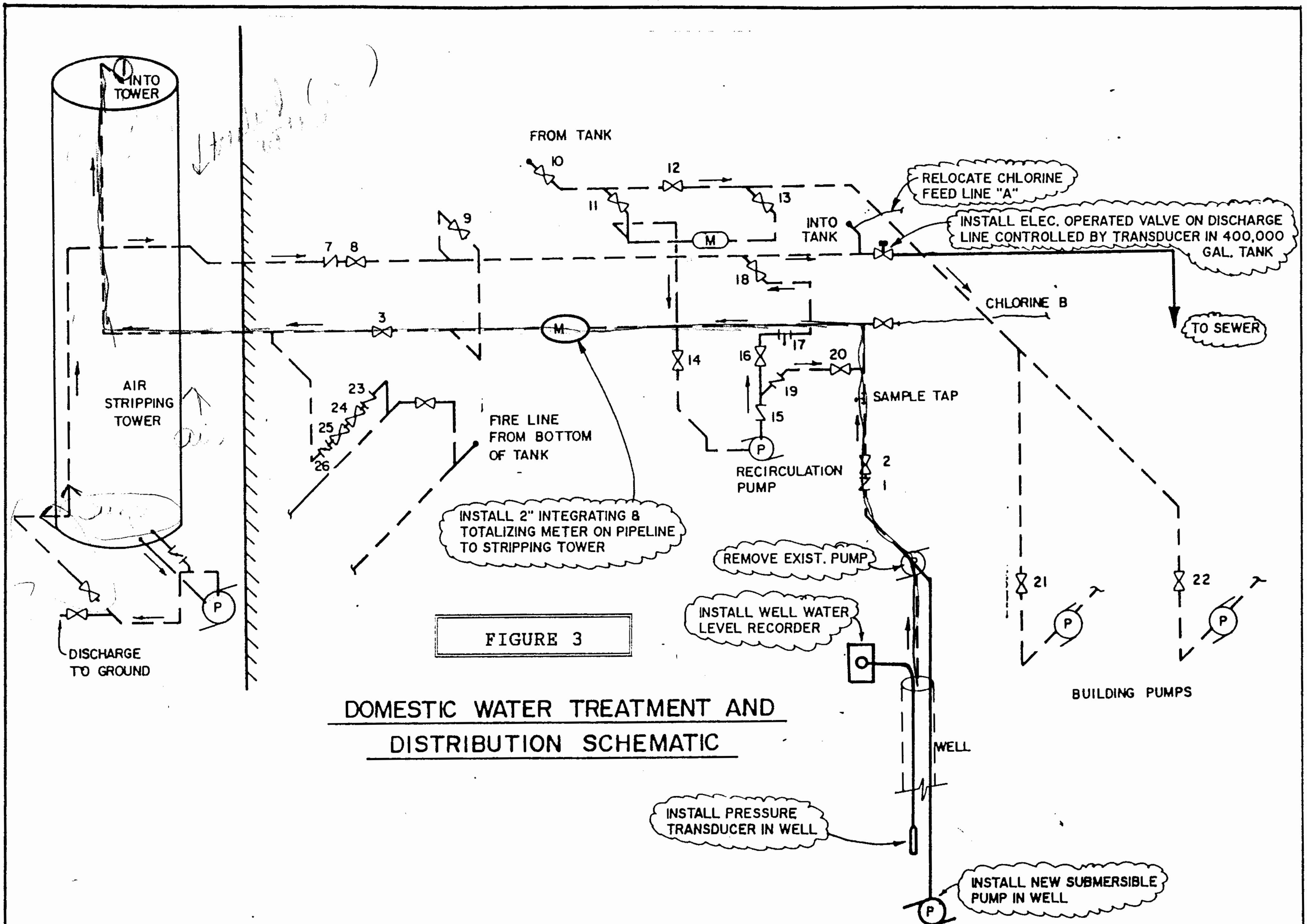


FIGURE 3

DOMESTIC WATER TREATMENT AND DISTRIBUTION SCHEMATIC

2.4 Required Permits

2.4.1 Production Well Treatment System

This system has been permitted by PaDER as Public Water Supply Permit No. 5488509 issued on July 19, 1989. The facilities were placed in operation in February, 1990 and have been used since then to treat approximately 5,000 gpd of water at a rate of 100 to 120 gpm for plant use. Per a telephone call on August 24, 1993 to Richard Stepanski, PaDER, Wilkes-Barre office, Cowan Associates, Inc. confirmed that no modification of this permit Public water supply is required as long as the treatment capacity of the stripping tower is not exceeded (120 gpm). No permit is required from the Delaware River Basin Commission for this groundwater withdrawal since no more than 100,00 gpd is withdrawn on a 30 day average.

2.4.2 Well 5 Treatment System

Since this system will be separate from the production well, no operating permits are required. A discharge permit is required. See Section 2.4.

2.4.3 Air Discharge

Dixon has received from PaDER an exemption for collection of volatiles from the production well air stripping tower. Exemption was issued per 225 PA Code 127.14(8). A copy of the exemption certificate is attached in Appendix I.

2.4.4 National Pollutant Discharge Elimination System (NPDES) Sewage Permit

Dixon Wearever holds an NPDES permit to discharge 4,000 gpd of treated wastewater from its on-site sewage treatment plant at Discharge 001. The discharge outfall is located on Pine Creek, approximately 1,200 feet east of the Dixon plant. They are also allowed to discharge stormwater from the plant grounds to the roadside ditch along Route 61. This existing permit is included in Appendix I.

Since this project will discharge all water through the permitted Discharge 001, the existing NPDES permit will need to be revised. Mr. Joe Scalia, PaDER Wilkes-Barre office, advises that a revised permit can be approved within 60 days of receipt by Mr. Paul Swerdon, Permits Chief, PaDER Wilkes-Barre Regional Office. OK

2.5 Well 5

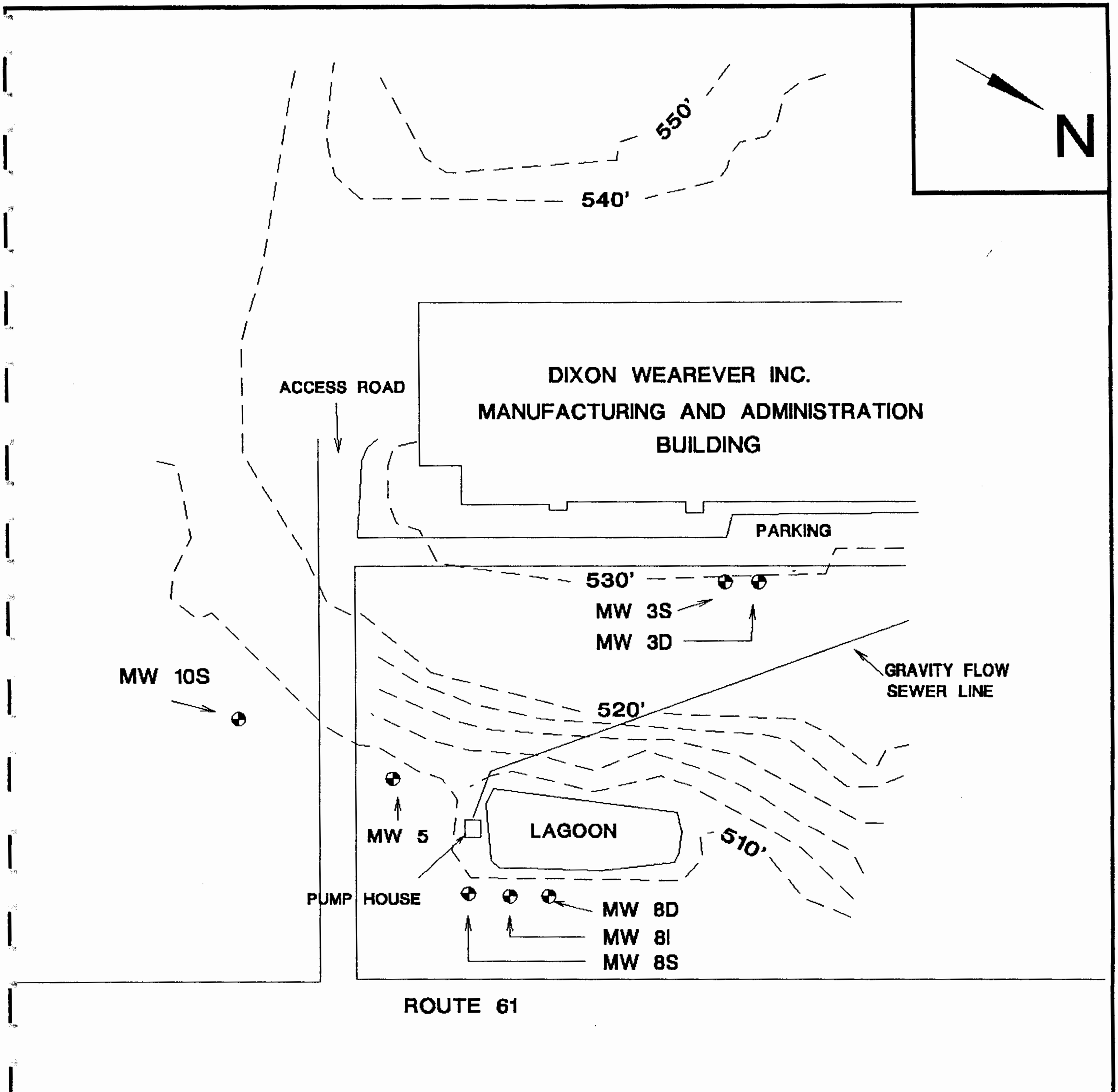
2.5.1 Design Plan

The purpose for the use of Monitoring Well 5 as a recovery well is to provide a supplemental groundwater pumping pulse to complement the pumping operation conducted at the Production Well on-site. Well 5 will be pumped out of phase from the production well. The intention is to allow adequate recovery time to insure complete recovery of the groundwater level to near pre-pumping conditions between each pump cycle. It has been presented by the USEPA that the oscillation of the groundwater at MW5 will enhance recovery of contaminated groundwater at the production well and the drawdown at this location will capture contaminated groundwater that has migrated downgradient from the site.

The pump in Well 5 will be sized for 18 gpm capacity. This design parameter was determined by review of previous pumping tests conducted on the well. In order to operate the well in a dynamic mode, the targeted pumping schedule will be 180° out of phase with the pumping schedule for the production well. The startup pumping rates are discussed in Section 2.6.

Pumping and non-pumping water level measurements will be recorded in MW5 and these data will be used to adjust the pumping schedule if this is necessary to achieve the program objectives.

The groundwater removed from Well 5 will be treated in a granular activated carbon (GAC) treatment system that has been designed to achieve a concentration of TCE less than 1.0 ppb in the final effluent. The treated groundwater will then be discharged to Pine Creek through the existing permitted outfall. The treatment system will be installed immediately adjacent to the location of the MW5. A prefabricated heated structure will be constructed to house the treatment system and MW5 well head. The polished effluent from the treatment system will be piped approximately 100 feet to intercept the permitted discharge line adjacent to the existing pump house (Figure 4, Site Plan).



INTEX INC.	DIXON WEAREVER DEER LAKE, PA. AUGUST, 1993	SITE PLAN FIGURE 4

Analytical data from groundwater samples collected from MW5 are available from the quarterly groundwater monitoring reports submitted to USEPA by Dixon Ticonderoga from 1989 through the present (Appendix V).

The principal compounds of interest at this location for the purpose of the design of the GAC system are 1,1,1-trichloroethane, 1,1-dichloroethane and trichloroethylene. A summary of these data are presented in Appendix V. The mean value for trichloroethylene is 6.1 ppb, 1,1-dichloroethane is 1.8 and 1,2 dichloroethylene is 0.5 ppb if the data point for May 29, 1992 is not included. This average figure will be used as the chemical concentration basis of design.

2.5.2 Recovery Well and Treatment System Design Details

The treatment system will consist of a 2 horsepower, 440v 3p submersible well pump, a 10 micron dual canister sediment filter, and a series-linked pair of GAC canisters each containing 330 pounds of virgin activated carbon and a gross weight of 440 pounds each. System controls will consist of a low-level shut off system for pump protection, an automatic timer with battery back up for pump cycling, and an overflow emergency shut off system. The well head and treatment system will be housed in a heated structure with locking doors.

The well is 60 feet deep with a 20 foot unscreened open borehole interval beginning 40 feet below the existing surface elevation (Figure 5). Thirty feet of six inch casing followed by ten feet of sand and gravel pack and twenty feet open rock bore hole comprise the general construction character of the well. The water table is located approximately 16-20 feet below grade. The well pump will be positioned approximately 5 feet above the bottom of the bore hole. This will allow for a potential maximum drawdown of 35 feet. The well will be fitted with an access part and tube for the purposes of collecting water level measurements. The discharge line from the treatment plant to the sewer discharge line will be buried at a depth of three feet for frost protection.

The size of the granulated activated carbon (GAC) units were based to accommodate the maximum hydraulic flow of the proposed system of 18 gpm. Based on the GAC isotherms for the principal compounds of interest, the proposed pumping rates and the concentrations observed in the quarterly monitoring data the expected carbon utilization is 0.6 pounds per day. With a GAC charge of 330 pounds per canister breakthrough is not anticipated before the completion of the remedial program. The theoretical carbon service life for each canister is expected to be 6 years assuming a daily pumping cycle is 6 hours/day. Based on this analysis it is possible that carbon change will not be necessary during the life of this project.

WELL CONSTRUCTION SUMMARY

WELL: #5
PROJECT: David Kahn

GEOLOGY

Thin, pebbly soil at surface

Yellowish, deeply weathered shale to 40 ft.

Water table at 38 feet

Grey shale, relatively unweathered, from 40 ft. to total depth

Confined or semi-confined water bearing zone at 50-60 feet.

FT. **CONSTRUCTION GRAPHIC**

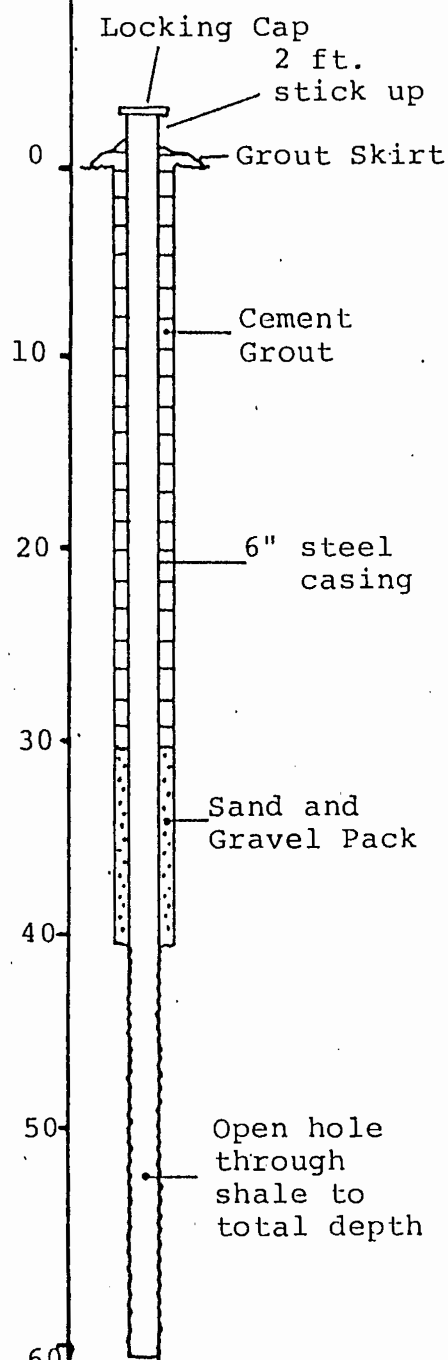


FIGURE 5

Construction Details

Location: David Kahn

Driller: Snyder
Date Started: 9/24/85
Date Completed: 9/24/85

Driller's file name: Snyder

Yield: >18 gpm
How Determined: pumping test

Total Well Depth: 60 ft.

Static Water Level: 17.65
Date: 9/25/85

Casings:

Diameter	Depth
6"	40'

Grouting Details:

Water Bearing Zones:

Depths	Yield
38-50	trace
50-60	18-20 gpm

Data provided by:

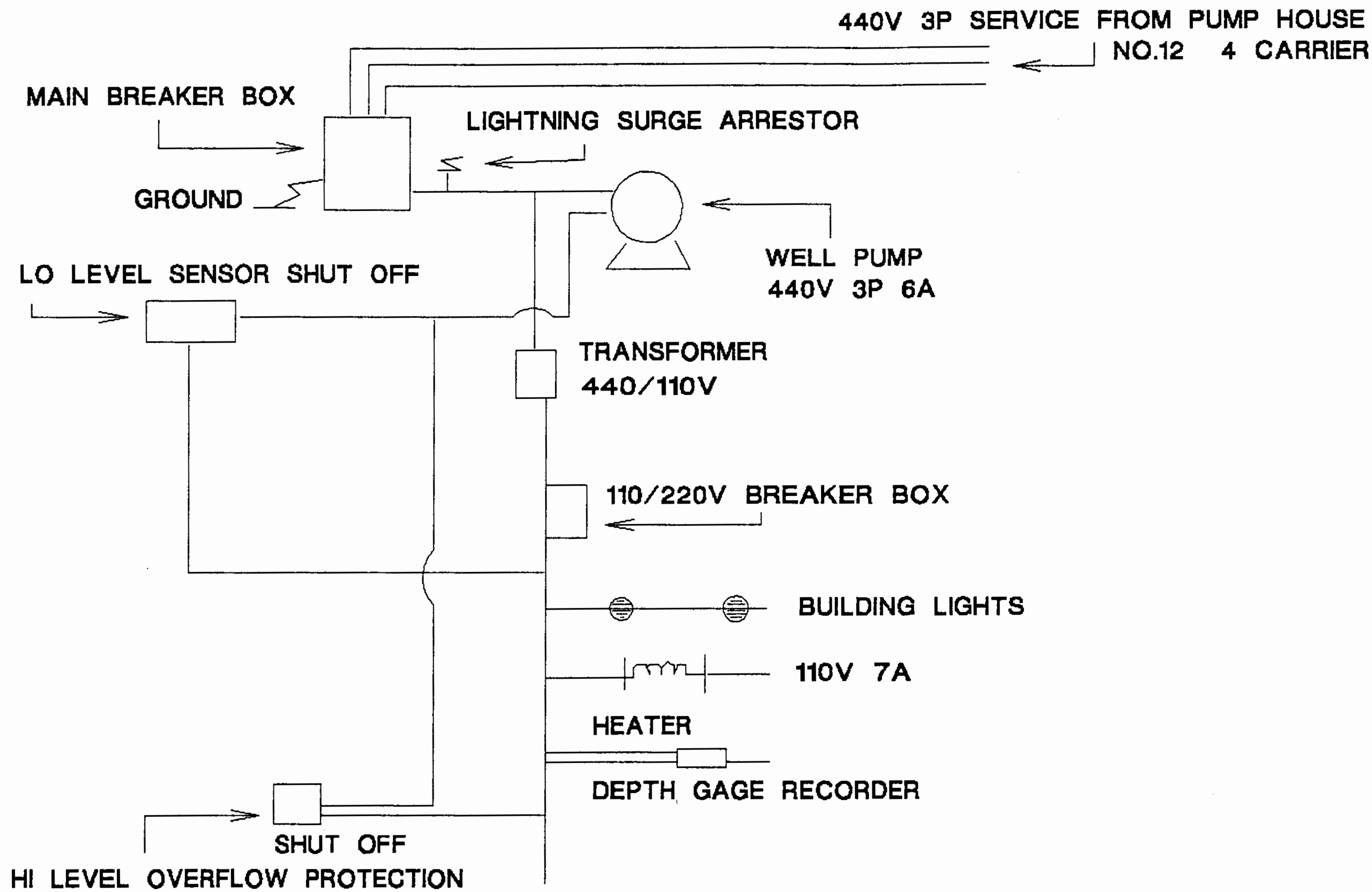
INTERNATIONAL EXPLORATION, INC.
577 SACKETTSFORD ROAD
WARMINSTER, PA 18974-1399
(215) 590-7137

Date:

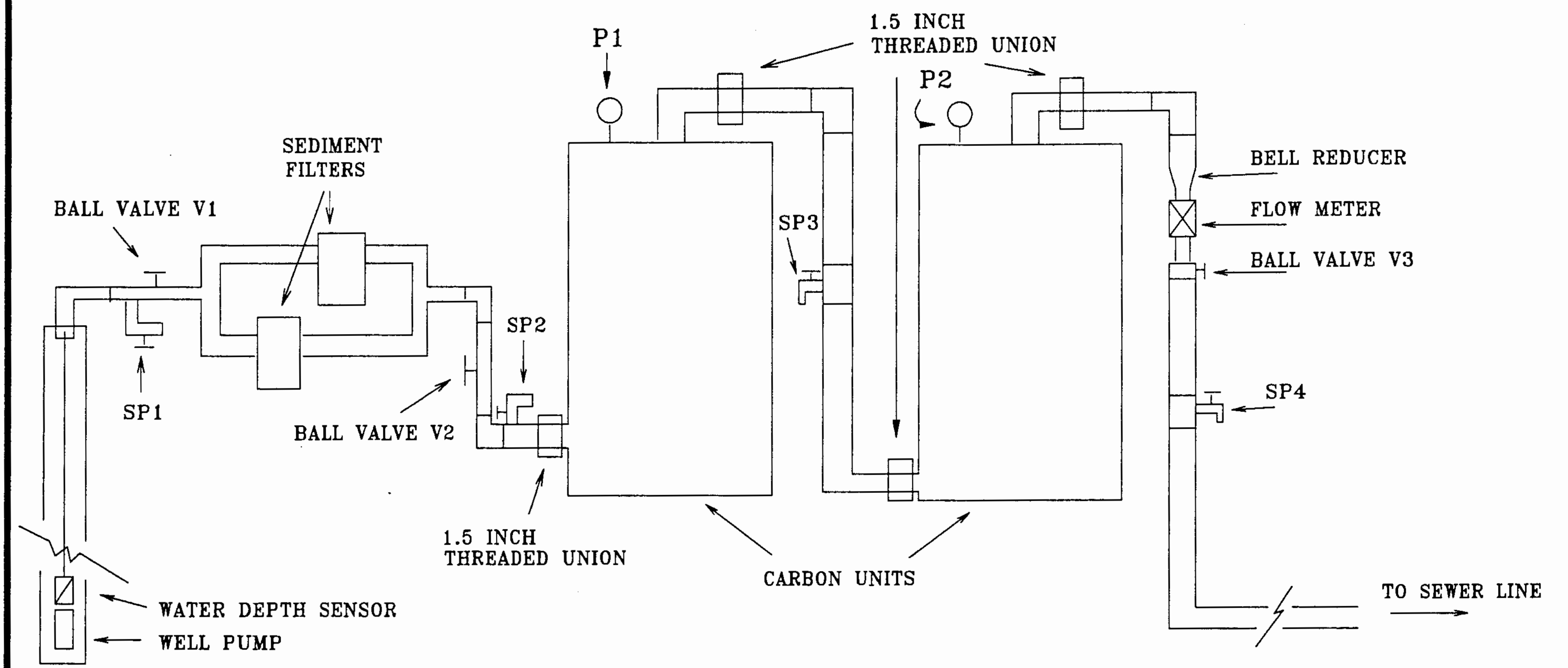
INTEX

A site plan showing plant layout and the treatment area is presented in Figure 4. The monitoring well and treatment system is readily accessible from the main drive to the facility. Electrical utilities will be provided by a proposed underground utility line originating from a power tap at the existing pump house. The electrical service at the existing pumphouse is 3 phase, 440 volts with adequate excess capacity to support a 30 amp tap from the main panel. The 440v 3p service will be brought to a panel in the treatment building (see Figure 6) Electrical Schematic (MW5 Treatment System). The well pump will operate on 440v, 3p current. A step-down transformer will be installed to provide 220/110v service for the remaining electrical components of the treatment system. Discharge from the treatment system will be pumped through a force main to the gravity sewer line at the existing pump house. The systems for operational controls and emergency controls consist of flow control valves V1, V2, and V3, low water level sensor and the high level shut-off positioned inside the spill containment berm. The piping and control devices are schematically presented in Figure 7. Piping and Instrumentation Diagrams and the containment berm is depicted in Figure 8, Process Flow Diagram. The low water level sensor will function to shut down the well pump in the event that the groundwater level is drawn down to the well pump intake. This will prevent dry running and the potential for pump damage.

The high level shut off will be located inside the containment berm and will be set to shut off the well pump in the event that the



INTEX INC.	DIXON WEAREVER DEER LAKE, PA. AUGUST, 1993	ELECTRICAL LINE DRAWING FIGURE 6



* SPi DENOTES SAMPLE VALVE
* Pi DENOTES PRESSURE GAGE

INTEX INC.	DIXON WEAREVER DEER LAKE, PA. AUGUST, 1993	PIPING AND INSTRUMENTATION DIAGRAM FIGURE 7

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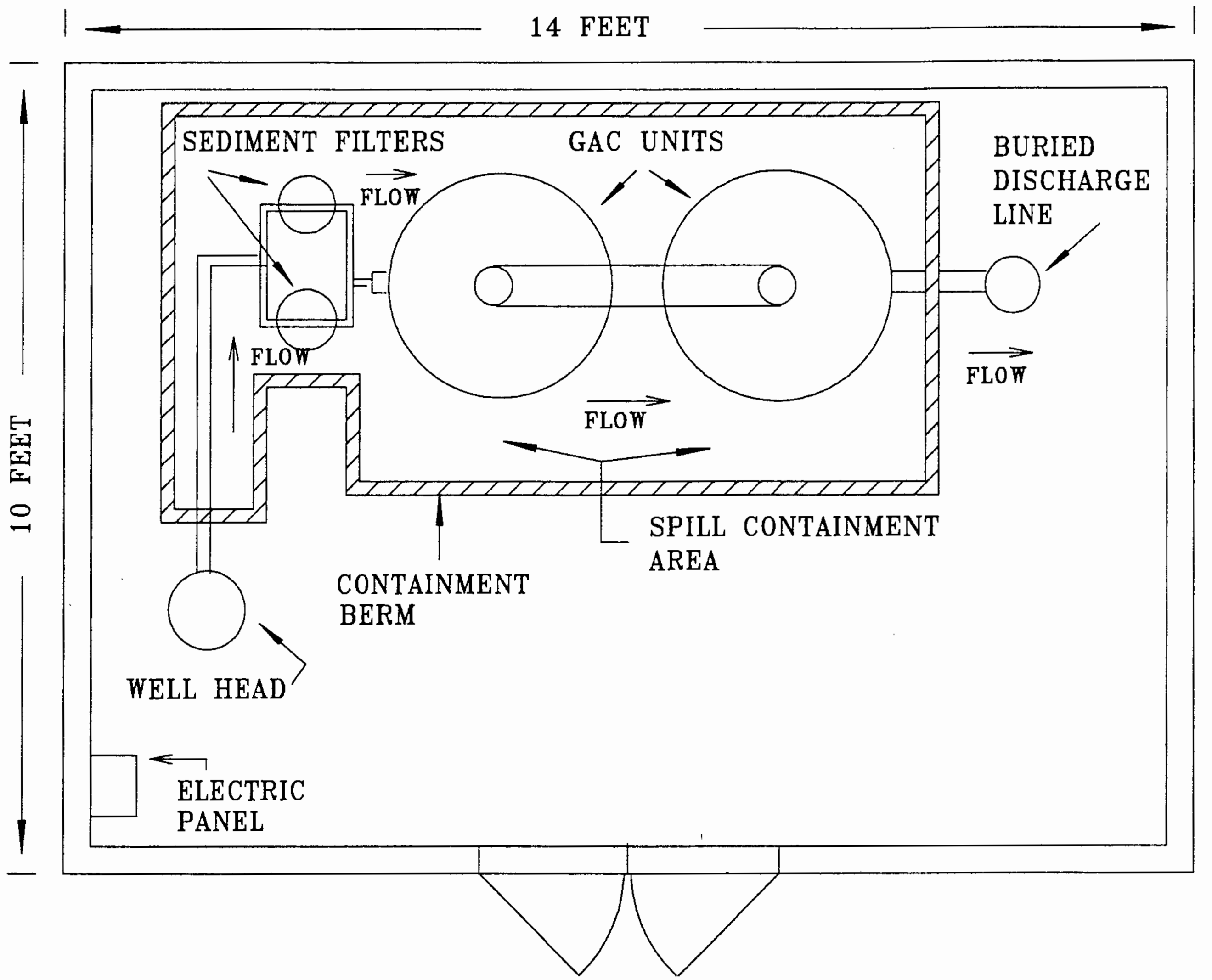

INTEX INC.

MW5 TREATMENT SYSTEM
DIXON WEAREVER DEER LAKE, PA. AUGUST, 1993

PROCESS FLOW DIAGRAM
FIGURE 8

water depth in the containment berm reaches 4 inches in depth. The containment area will be constructed of 10 mil polyethylene over a wooden berm. The berm will be anchored to the building floor. The containment area will have a volume of 33 cubic feet. The carbon canister units each have a volume of 16 cubic feet. In the event of a complete structural failure of both carbon units the bermed area has the capacity to contain the entire spill.

A Process Flow diagram is presented in Figure 8. The influent groundwater is pumped through two 10 gpm/rated sediment filters (10 micron) in parallel. A sampling tap will be located in front of the sediment filter to extract raw water samples. The water is then passed through the two GAC units which are plumbed in series. A sampling tap will be located in line between the two filters to monitor for breakthrough of volatiles from the primary absorber. After the second GAC unit a sampling tap is located in-line to collect final polished effluent samples, the water is then passed through a totalizing flow meter and discharged to the gravity sewer line through a force main.

A list of major equipment for the Well 5 remediation system is included in Table 3. Manufacturers specifications are included in Appendix VI.

Based on the fact that the contaminants in the groundwater (TCE, DCA, DCE) are not flammable, the observed concentration of these contaminants in the groundwater is low, and the treatment system is a sealed unit, it is not anticipated that there will be any build-up of toxic or flammable gases in the treatment building. It is determined that it is not necessary to provide explosion-proof switching boxes or to monitor for gas buildup. Opening the six foot wide double door during inspection visits will insure that the monitoring building is adequately ventilated.

TABLE 3
MAJOR EQUIPMENT LIST, WELL 5
GROUNDWATER REMEDIATION SYSTEM

DESCRIPTION	Suggested Mfgr./Mod. No.
Granulated activated Carbon Canisters (330lbs. carbon)	Tigg Corp. CANSORB C25
2hp 220v/440v Well Pump	Red Jacket 200TI-N12GC
Trenching and backfill	
1½" Piping (300 feet)	polyproplene SDR 15
Wiring 150′ (4 carrier, 12 gage)	Capital UF-B
Electric Panel Box	Square D
440/120v Transformer (30amp) (Step down 440V - 220V)	Jefferson 213-164
Low level shut off controls (Coyote Box)	Coyote Inc.
Timer with battery backup	
Water Meter - Cumulating	Corad/10707
Magnahelic Differential Pressure Gauge	Dwyer/3T064
Valves & fittings	
16′ X 10′ prefabricated storage building	
Heater & thermostat, 1600 watt	

2.6 Pumping Schedules

The ideal pumping schedule for the recovery wells would be one in which maximum plume control and gradient reversal is achieved at a minimum pumping rate. The most efficient pumping schedule would also remove a maximum of volatiles-impacted groundwater while drawing in a minimum of clean water from outside of the plume.

It is anticipated that the pumping schedule will change over the life of the project as the distribution and concentration of volatiles within the plume changes. Previous pumping tests and water level monitoring have provided a basis for design of a start up pumping schedule. The start up phase of groundwater remediation will be used to fine-tune the pumping schedule and determine how best to operate the two recovery wells in concert.

Water level monitoring data collected during the CMS has shown that the production well can induce drawdown ranging from 0.5 to 2.0 feet in the center of the plume and at the downgradient property boundary (wells 3s, 5s, and 8s) in the shallow portion of the phreatic zone, when pumping at approximately 100 gpm. Even greater drawdown is induced in deeper zones (wells 3d, 8i, and 8d). This data is shown graphically in Appendix IV.

The goal of the pumping schedule for the production well will be to maintain drawdown of at least 1 or 2 feet (either active or residual) along the downgradient property boundary. Based on past monitoring data this approach will also cause drawdown along the edges of the plume. During this process, care must be taken to maintain enough cover over the pump in well 5 to allow its use as a second recovery well and gradient reversal well.

The goal of the pumping schedule for well 5 will be to induce drawdown from a downgradient pumping source, thereby reversing the hydraulic gradient formed by the production well. Well 5 may also be able to accelerate remediation of the downgradient edge of the plume if it can draw in water from the vicinity of well 8s, which is 170 feet away. Pumping tests conducted in well 5s indicate that is does not significantly influence well 8s within 100 minutes of pumping. Therefore, it will have to be pumped for longer periods in order to induce significant drawdown in the vicinity of well 8s.

Considering the objectives and limitations outlined above, the initial pumping schedule and sequences for the production well will be as follows:

1) The production well will pump for 7 hours at a rate of 100 gpm.
2) The entire system will rest and recover for 5 hours.
3) Well 5 will pump for 5 hours at 8 to 10 gpm.
4) The entire system will rest and recover for 7 hours.
5) The pumping sequence will repeat.

The initial pumping schedule allows for 50% recovery time. This is because the effects of long term pumping of this magnitude are as yet unknown in this case, and dewatering of the aquifer without adequate recovery is undesirable. A constant and consistent drawdown and recovery of the water table is more desirable since it will provide a washing effect for volatiles in the shallow saturated zone. This schedule will provide significantly more remediation then is currently taking place since it will withdraw and treat 44,000 to 46,000 gpd of groundwater in comparison to approximately 15,000 gpd currently being treated.

The planned pumping rate of the production well (100 gpm) is consistent with the present operation of the well. Although the pump presently operates at approximately 120 gpm when first activated, it decreases to 100 gpm ± after 200 minutes, probably as a result of increased pumping head.

The results of the pumping sequence on the local hydrogeologic regime will be evaluated after 1 month of operation to determine if additional pumping time can be accommodated or if pumping time must be decreased to prevent excessive dewatering. The pumping systems for the production well and Well 5 are designed for rates as high as 120 and 18 gpm respectively, and both will be programmed to turn on and off by time clock. This will allow for much flexibility when modifying the pumping schedule. The EPA will be notified of any changes in the pumping schedule.

It is difficult to estimate the length of time it would take to achieve the cleanup standards set in the FDRTC. It is conceivable that cleanup could be achieved in as little as two to five years under ideal conditions. However, if flushing of the aquifer proceeds slowly, any projection beyond 5 years would be conjecture. It is anticipated that, if significant reduction of volatiles concentrations is not achieved in 2 to 3 years, the effectiveness and viability of this remedial alternative will have to be re-evaluated.

3.0 OPERATIONS AND MAINTENANCE (O&M)

3.1 Operation and Maintenance of Production Well System

3.1.1 Description of Systems

Air stripping is a mass transfer process. Volatile compounds are exposed to air, removed in an amount based upon the ratio of air to water at the temperature at which the system is operating. Such a system was placed in operation at Dixon Ticonderoga in February, 1990, and will remain essentially unchanged as it will continue to produce drinking/industrial water for the plant and become the groundwater clean-up unit. Plant personnel have been operating the system since it was installed and are familiar with its operation.

The heart of a stripper is its packing. The packing is constructed to allow for counter-current passage of water flowing down by gravity and of air flowing up through the packing under pressure supplied by a fan. Influent water is dispersed suitably on the surfaces of the packing, as a thin film. Air is introduced at the bottom. In accordance with defined physical laws, molecules of the dissolved volatiles are driven to cross the water-air interface in an attempt to reach a neutral equilibrium of concentrations in the air and water. In stagnant air and water conditions, and in an enclosed space, such equilibrium would be attained very quickly and no mass transfer would take place. It is the continuing supply of air which maintains the "driving force" to be driven off into the atmosphere. The amount of air supplied for a given amount of water is a key consideration in a stripper design. Within certain qualifications, increased airflow increases air stripping efficiency.

The process is simple: pump water from the ground; spread it into an elevated media, blow air up through the media, and use or dispose of the water that drains through the media.

3.1.2 Start-up Procedures

Following installation of the previously described additional equipment, the following checklist will be followed:

1. Production well pump will be started and pumped to the stripping tower.
2. Power will be supplied to the stripping tower and blower pump so that they will automatically start.
3. Tank water level will be monitored and controller set points established to:

a. discharge water to the tank or to the sewage system.

b. shut down the production well pump in the event of low water level in the production well.

c. override the time clock in the event of a low water level in the storage tank.

d. shut down the chlorination feed when flow is discharged to the sewerage system.

4. Set time clock.

5. Set floats in the effluent pump station at the control levels for starting pump 1, starting pump 2, high water alarm, and pump shut off level.

3.1.3 O & M Procedures

These are the major components of the Production Well System:

1. A submersible well pump to deliver water to the stripping tower at a rate of ±100 gpm.

2. A stripping tower with polyethylene packing.

3. Stripping tower pump to recirculate water.

4. Blower to provide air.

5. An effluent pump to deliver treated water to the treated water storage tank or to the sanitary sewerage system downstream of the sewage treatment plant.

The system's mechanical components are subject to wear and breakdown, and thus must be monitored per manufacturer's recommendations to assure the longest operational life. Other than mechanical failure, the most common factor resulting in a stripper performance drift is fouling of stripper packing.

Fouling basically results in the following chain of respective causes and effects:

1. Restriction of packing void space.
2. Reduction of airflow.
3. Reduction of the stripping factor.
4. Reduction of removal rate.

Fouling is mostly caused by oxidation of minerals in the water and accumulation of precipitates in the packing. The precipitates may combine with biological growth, as sometimes is the case with iron. Iron deposits or biological growth fouling have not been a factor to date with the existing system.

<u>The following checks will be completed according to the designated schedule.</u>

	Daily	Weekly	Monthly	Quarterly	Yearly
1. Check time clocks to confirm pumping regime meets estimated parameters.		X			
2. Check chlorine solution/chlorination system.	X				
3. Record meter readings water from well; water to plant; water from effluent pump station.	X				

	Daily	Weekly	Monthly	Quarterly	Yearly
4. Check water level recorder (well and tank).	X				
5. Change charts on recorders.		X			
6. Check system for abnormalities.	X				
7. Check packing for fouling.			X		
8. Calibration of transducers					X
9. Check discharge point for problems.			X		
10. Calibration of meters.			Every three years		

A checklist will be completed for each inspection of the production well system and kept on file at the Dixon facility. A copy of this checklist is included in Appendix VI.

The operational history of the stripper has proven it capable of reducing concentrations of volatiles in the effluent water to below drinking water standards. Samples of influent and effluent water will be collected on a quarterly basis and analyzed for chlorinated volatiles (see Section 8.0 for analytical methods).

3.1.4 Replacement Schedule - There are no operational parts that need replacement other than recorder charts and chlorine. Mechanical equipment will be replaced as required upon breakdown. Expected life of the production well treatment equipment, including the well pump, is 7 to 10 years. Chlorination pumps have a shorter life and it is expected that they will require replacement on a 5 year schedule.

3.1.5 Production Well Contingency Procedures

1. Upon failure of any of the treatment equipment, the system will shut down and water conservation practices implemented as this system supplies plant water as well. Unreserved water storage is limited to 50,000 gallons - a 10 to 15 day supply.
2. Upon failure of any stripping tower component, the manufacturer, Delta Cooling Towers, Inc. of Fairfield, NJ, will be contacted for spare parts. All components are available within a 2 week turnaround period.
3. Upon failure of the electric bypass control valve, its companion tank transducer, or the recorder, the valve will be manually opened and closed based upon visual inspection of the water level. This is not a critical component.

4. A spare time clock will be kept on site for replacement, should a time clock fail.
5. Well level transducer is not considered a critical component; in the level of its failure, well pump will not be shut down. Well level measurements will be taken manually on a weekly basis should the transducer fail.

6. A temporary replacement submersible well pump can be installed within a 5 day turnaround period by a well supply contractor such as Meyerstown Kohl Brothers, Inc.

3.2 OPERATION AND MAINTENANCE PLAN OF WELL 5

3.2.1 Start Up Procedures

The start up procedures fall into two categories; instrumentation and system testing, and initial operational settings.

The instrument and system testing procedures are as follows:

- o System Leak Check

  The system will be pressure checked for leaks from the well head to the flow meter before water is introduced to the system. Valves V1 and V3 will be closed and an air supply will be attached to the system at SP2. (See Figure 7). The system will be pressurized to 10 psig as recorded on the air supply pressure gage. The air supply valve will be closed and the pressure will be observed. If there is no deflection on the pressure gage in ten minutes, the system will be considered leak-free. Any leaks that are detected will be repaired and the leak check procedure repeated.

- o Low Water Level Sensor Check

  The proposed low water level sensor will be acceptance tested before it is brought to the site. The unit will be field tested as installed with continuity checks by digital Voltmeter on site.

- Power and Continuity Checks

  The power supply for the well pump will be checked for voltage, the panel box for 110v service will be checked for load balance at full load on the system and all breakers will be checked for correct labellings.

- Flow Rate Checks

  The well pump will be run at maximum capacity through the treatment system.

After the initial system testing the pump will be turned on and the well will be pumped at 18 gpm. During this time water levels will be recorded at 5 minute intervals until the water level has stabilized or until the drawdown is within one foot of the top of the pump. The pump will then be turned off and the water level monitored until the well has recovered. Based on this information, changes may be made on the duration of pumping intervals targeted for normal operational mode. Pumping flow rates will be varied by adjusting valve V3 (Figure 7). Flow rate will be calculated by noting the

cumulative flow on the system flow meter, over a fixed time interval.

Pressure (ADF) across the sediment filter will be measured using a differential manometer or a magnahelic gauge calibrated from 0 to 60 inches H_2O or 2 psi. The magnahelic gauge will be attached across SP1 and SP2. The initial ▲PF over the filter system will be recorded and the ▲PF will be recorded bi-weekly as part of the Operation and Maintenance check Procedure. An increase in the ▲P of 30 inches H_2O or 1 psi will require a filter change.

Pressure drop across each carbon unit (▲pc) will be measured by a differential magnetometer or a magnahelic gauge calibrated from 0 to 60 inches H_2O or 2 psi. The pressure drop will be measured across SP2 and SP3 for the lead carbon canister and betweeen SP3 and SP4 for the second carbon canister. The initial ▲pc will be recorded and the ▲pc will be recorded bi-weekly. An increase of 30 inches H_2O or 1 psi in the ▲pc reading will require remedial action. A two step action plan will be taken to reduce the pressure drop across the carbon filter. The first remedy will be to chlorinate the filter by introducing a 3% stannous hypochloride solution into the well head and pumping for ten minutes at 10 gpm. Approximately 5 gallons of the chlorine solution will be introduced during the first five minutes of the pumping cycle. The system will be turned off for 20 minutes and then restarted after 10 minutes of operation re-measure the Δpc. If the Δpc has not decreased it will be necessary to back flush the carbon system. System backflushing is not a routine O&M procedure and will be covered as an O&M contingency procedure.

3.2.2 Operation and Maintenance Procedures

Initially the pump and treat system for Monitoring Well 5 will be operated for 5 hours daily at a pumping rate of 8-10 gpm. The operational time will be scheduled to be 180° out of phase with the production well pumping schedule. The anticipated operating schedule is as follows:

PUMP OPERATING SCHEDULE

Clock	2	4	6	8	10	12	14	16	18	20	22	24
PW	X	X	X	X								
MW-5							X	X	X			

PW - Production Pump
MW-5 - Monitoring Well 5 treatment System

X - pump on

The system is designed to operate with minimum maintenance required. The system will be checked twice weekly by trained Dixon personnel and a MW5 System Check List (Appendix VI) will be completed. In the event that any check list items exceed allowable limits the Dixon on site Coordinator will direct the proper corrective action as specified in this plan. During the life of the system the sediment filters will be periodically replaced when the pressure drop across the filter exceeds the manufacturer's recommended pressure drop across the filter or if the required flow rate cannot be maintained by adjusting the flow rate control valve (V3). One case of the spare filters will be stored in the Well 5 building for this purpose. Filter replacement and activated carbon change out procedures will be provided in the Manufacturer Operating Instructions. A compilation of manufacturer operating instructions will be prepared at the time of installation and located in the treatment building.

The activated carbon absorption capacity will be evaluated based on the analytical results of VOC analyses performed. When the absorptive capacity of the primary carbon unit is reached (ie. breakthrough) the second canister will be moved to the lead position and the spent canister will be replaced. At this time a replacement schedule for filters and carbon cannot be determined until an operating record for the well pumping activities has been developed. Based on the quarterly monitoring data records from 1988 through 1993 it is anticipated that the carbon absorptive capacity will be in excess of one year. In order to evaluate carbon breakthrough water samples will be collected from sampling points, SP1, SP3, and SP4 on a quarterly basis, and analyzed for chlorinated volatile organics (see Section 8.0 for analytical methods). The spent carbon canister must be handled as hazardous waste. The transportation and disposal of the spent canister will be handled by the carbon vendor.

3.2.3 Contingency Procedures

Possible operational failures that may occur that will disrupt the treatment program are as follows:

Electrical failure/power outages

Well pump failure

Piping leaks

Carbon canister rupture

Back up equipment and supplies available on site for emergencies are:

6 - 55 gal steel drums (min)

1 - Battery powered pump

2 - PVC patch kit

In the event of spills or failure of the piping system the well pump will be automatically shut down. The containment berm will prevent any liquid or, in the event of a carbon canister failure, granular activated carbon from escaping from the building. The subsequent spillage will be shovelled or pumped into the 55 gallon drums for disposal.

In the event that the carbon canisters become clogged and require backflushing, a contractor will be retained to perform the backflushing. This will require a storage vessel of at least 600 gallons to retain the backflush water for treatment or disposal. The system shall be backwashed at a flow rate of at least twice the operating rate and should be backwashed for a period of time equal to twice the retention time.

3.3 Groundwater Level Monitoring

In order to evaluate the drawdown, area of influence, and hydraulic gradient reversals caused by the recovery wells it will be necessary to collect water level measurements from monitoring wells on a periodic basis, during periods of active pumping and recovery. Water levels must also be monitored to ensure that adequate recovery is taking place to avoid dewatering of that portion of the saturated zone that is being remediated.

Water level monitoring will occur most frequently during the days immediately before and after the remediation system goes into operation. The monitoring will be concentrated on those wells in the center of the plume and in areas where concentrations of volatiles are above groundwater cleanup standards.

The general approach to the water level monitoring program will be to collect background water levels approximately once per week for four weeks prior to start-up. True background levels may not be possible to obtain because the production well must operate to supply the facility. However, water levels can be obtained after the pump has been off for several hours when some water level recovery has occurred. After the recovery wells are in operation, water levels will be collected frequently for the first several days. Water levels will be collected near the end of each pumping cycle to confirm that sufficient drawdown is occurring and near the end of each recovery cycle to ensure that sufficient recovery is occurring.

The wells in which water level monitoring will take place are as follows:

1s, 2s, 3s, 3d, 5s, 8s, 8i, 8d, and Production Well.

The production well will be equipped with a continuous water level recorder. Water levels in the other wells will be collected manually using an electric water level indicator, such as a Soiltest model DR-781 or similar.

The schedule for water level data collection will be as follows:

Four weeks before startup:	Once per week.
First two weeks after startup:	Once per day per pumping and recovery cycle.
After first two weeks of startup:	Twice per week per pumping and recovery cycle.

This sequence will be repeated (except for initial background monitoring) whenever a change is made in the pumping schedule or whenever a significant adjustment is made in the pumping rate. It is anticipated that, once a long term pumping schedule is arrived at, the water level monitoring program can be cut back to once per week. However, monitoring will not be cut back to once per week any sooner than four weeks after a change in pumping schedule or pumping rate.

Water level monitoring will be conducted by Dixon personnel after training by INTEX. All manual water level measurements will be collected using the same instrument, which will be dedicated to the site. All water levels will be recorded on monitoring data sheets, an example of which is included in Appendix VI.

Once every quarter, a groundwater contour map of the shallow saturated zone will be prepared to illustrate the configuration of the water table. One map will be prepared for each pumping and recovery phase currently taking place. Water levels from Wells 4s, 9s, and 10s, will be collected on a quarterly basis to assist in preparation of these maps. The maps will be submitted to the EPA with the bi-monthly progress reports.

4.0 CONSTRUCTION PLAN

The construction and modification of the groundwater treatment systems will consist of five general tasks:

- o Trenching of and installation of buried electrical and piping systems.
- o Installation of submersible well pumps.
- o Installation of water treatment systems and a pre-fabricated building.

- Installation of electronic control devices.
- Complete system wiring and powering of the system.

Industry-approved construction and wiring practices will be followed. Excavation and trenching operations will be in compliance with OSHA 2226. Electrical ground fault protection devices will be utilized in compliance with OSHA 3007. It is not anticipated that hazardous wastes will be encountered during this construction. The only task which may involve any actual contact with groundwater containing volatiles will be during removal of the old pump in the production well. The concentrations of volatiles in the production well are not high enough to cause a health and safety concern over the short duration period of the pump removal. During this task, the door to the pump house will be kept open for maximum ventilation and the working air space will be monitored for organic vapors. Workers handling the pump will wear long sleeve coveralls and rubber gloves to avoid contact with the water.

If, during trenching or other operations, any substances, containers, unusual decoloration or odors are encountered, construction will be immediately halted and the area evacuated. A evaluation of the situation will be made by an experienced project manager and an incident-specific contingency plan will be developed. USEPA will be verbally notified of the situation if it impacts the environment.

5.0 PROJECT MANAGEMENT PLAN

The management personnel who will be involved in the design, construction and monitoring phase of the CMI are as follows:

Frank Murphy, Dixon Ticonderoga, Sandusky, Ohio: Dixon's primary project coordinator. Will continue as Dixon's primary representative for all work being coordinated under the ACO. Will be responsible for approval of all deliverables, on behalf of Dixon, prior to submission to EPA.

John Barnetsky, Dixon Ticonderoga, Deer Lake, PA: Dixon's primary on site contact and coordinator for all site activities.

John Walker, INTEX, Doylestown, PA: General project manager for the CMI phase. Responsible for preparation of deliverables, scheduling and day to day contact with EPA. Will also serve as primary hydrogeologist in designing groundwater monitoring programs and recovery well pumping schedules.

William Kee, Cowan Associates, Quakertown, PA: Primary design and construction engineer for upgrading and retrofitting of the production well, air stripper and effluent piping. Will also be responsible for determining permit requirements and making applications.

Daniel FitzGerald, INTEX, Doylestown, PA: Primary design and construction engineer for the carbon treatment system to be installed at Well #5.

All of the above personnel will carry their respective responsibilities through the design, construction, O & M, construction implementation and monitoring phases. They will also be responsible for providing oversight and guidance to other project personnel and subcontractors who may be involved during the construction and implementation phases. During the operation and maintenance phase, it is anticipated that Dixon personnel will perform most of the work, with some training and guidance by William Kee and Daniel FitzGerald.

6.0 WASTE MANAGEMENT PLAN

6.1 Groundwater

It is anticipated that very little waste, and essentially no hazardous waste, will be generated by construction and O & M of the groundwater remediation systems. The only potentially hazardous material that may be generated by this corrective measure would be filtrate and spent carbon at Well #5. Considering the concentration of volatiles in Well #5, carbon changeout will occur very infrequently. Some potentially hazardous material might also be generated at the production well if the air stripper packing ever needs cleaning or replacement. The volumes of any hazardous waste would be small. Should any hazardous waste be generated, it will be collected, containerized, characterized and disposed in accordance with all applicable state and federal regulations.

Some excavation and trenching will be conducted at the production well and Well #5. However, all excavation activities will occur in clean soil. Any excavated soil that is not used to backfill the trenches will be used as fill elsewhere on the property.

6.2 Soil

As described in section 2.1.1, waste soil generated during the remediation of Areas 1 and 7 (approximately 37 tons) was classified as non-hazardous for disposal purposes and will be landfilled at Wayne Disposal in Michigan.

Soils excavated from Areas 11 and 12 (approximately 500 tons) are currently undergoing on-site bioremediation and will be used as on-site fill upon completion of treatment.

7.0 PROJECT SCHEDULE

The following is the anticipated implementation schedule for the groundwater remediation system.

TASK	DURATION (WEEKS)	WEEKS AFTER EPA APPROVAL OF CMI PLAN
Submit NPDES permit revision	1.0	1.0
Order and receive equipment	6.0	7.0
Installation and Construction	2.0	11.0
System Testing	2.0	13.0
System in Operation	---	13.0

This schedule assumes that the revised NPDES permit is received by the 10th or 11th week and that weather conditions will permit construction.

8.0 MONITORING PLAN

8.1 Monitoring Network and Sampling and Analysis Schedule

In order to monitor and evaluate the effectiveness of the groundwater remediation system, it will be necessary to track the concentrations of volatiles in the groundwater on a periodic basis. This will be accomplished through the sampling of selected monitoring wells and the charting over time of the concentrations of volatiles in these wells. This plan addresses only water quality monitoring. Water level elevation monitoring to determine hydraulic control of the plume will occur on a more frequent basis and is addressed in section 3.0, Operation and Maintenance.

It is proposed that all of the on-site wells, plus one off-site well, in which chlorinated volatiles have been detected be sampled on an annual basis. The water quality in the recovery wells and nearly monitoring wells will be evaluated on a quarterly basis. The proposed monitoring network for the CMI phase is outlined in Table 4.

TABLE 4
GROUNDWATER QUALITY MONITORING
NETWORK FOR CMI PHASE

SAMPLING FREQUENCY	WELLS
Quarterly	2s, 3s, 8s, 5s, Production Well
Annually	1s, 2s, 3s, 3d, 4s, 5s, 8s, 10s, Production Well, Driving Range Well

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The reasoning for the monitoring network as proposed is as follows:

1) Background (upgradient) groundwater quality has been established through the quarterly sampling of well 4s since 1985. The water quality in this well has proven to be consistent throughout its period of monitoring. Therefore, there is no need to establish background quality on a quarterly basis, and annual re-establishment of ambient water quality is considered sufficient.

2) The quarterly monitoring wells are located in the portion of the plume where the highest concentrations of volatiles occur and where the most intensive cleanup is required. Tracking the progress of the cleanup in this area will provide a good indication of the effectiveness of the remediation on a short-term (quarterly) basis.

3) Sampling of the annual monitoring well network will provide a "snapshot" of groundwater quality within the entire plume area. The wells that are targeted for annual sampling only are those in which volatiles have only been detected at concentrations below the clean up levels in the FDRTC, and annual evaluation of these areas is considered sufficient.

The analytical parameters for all sampling events will be trichloroethylene, 1,1,1 trichloroethane, 1,1 dichloroethane, 1,1 dichloroethylene, 1,2 dichloroethylene and vinyl chloride by EPA method 8010. These will be the only analytical parameters. All other parameters currently being analyzed, such as total organic carbon, specific contaminations, dissolved solids and total organic halogens are considered unnecessary and will be discontinued pending notification to PaDER.

All sampling and decontamination procedures and protocols will conform to those outlined in the original RFI work plan. Quality assurance samples for annual monitoring will consist of a trip blank and a blind duplicate. All quality assurance samples will be analyzed for the same parameters as groundwater samples.

It is proposed that the annual monitoring network be sampled as the third sampling event after the remediation system goes on-line. This will allow a full nine months of aggressive groundwater remediation before a comprehensive review of its effectiveness. After review of the results of the annual groundwater sampling, a determination will be made as to whether any modifications to the monitoring plan are needed.

8.2 System Shutdown

The groundwater remediation system will be shut down when concentrations of volatile organics from two consecutive quarterly sampling events are at or below the cleanup standards set in the FDRTC. These standards are listed in Table 5.

TABLE 5
GROUNDWATER CLEAN-UP STANDARDS

COMPOUND	STANDARD (ug/l)
1,1 dichloroethane	610 ? NO
1,1 dichloroethylene	7
1,2 dichlorothylene	61 ? 70 *
Tetrachloroethylene	6 ? 5
1,1,1 Trichloroethane	200 200
Trichloroethylene	5 5

Based on the results of the RFI (sampling date 5/10/90) the wells which contain one or more of the above compounds above cleanup standards are wells 3s, 8s and the production well.

Upon cessation of the groundwater remediation system, groundwater monitoring will continue according to the plan outlined in 10.1 for four more quarters in order to confirm clean-up. If clean up standards are met for four quarters it will be recommended that the groundwater remediation phase of the CMI be closed.

Upon recommending closure of the groundwater remediation system, the water quality data will be checked for statistical validity by determining the 95% confidence interval of the mean of the most recent four quarters of groundwater quality data. If the upper 95% confidence limit of the mean of the data set for each compound is below the clean-up standard, the data will be considered statistically valid. Data from quarterly and annual wells will be analyzed separately.

9.0 COST ESTIMATE

9.1 Capital Costs

Production Well:		
Equipment, Materials and Installation		$10,950
Excavation and Subsurface Piping (installed)		14,800
Engineering and Consulting		1,500
	Subtotal	$27,250
Well 5:		
Equipment, Materials and Installation		$14,000
Engineering and Consulting		1,500
	Subtotal	$15,500
	TOTAL	$42,750

9.2 Operation and Maintenance (O&M)

The following O&M costs are for one year of operation, based on present worth.

Production Well:		
Power		$ 4,900
Labor and Operations		7,300
Laboratory Analysis		3,600
Engineering and Consulting		1,000
	Subtotal	$16,800
Well 5:		
Power		$ 1,000
Laboratory Analysis		3,600
Supplies		900
Engineering and Consulting		1,500
	Subtotal	$ 7,000
Groundwater Monitoring:		
Sampling & analysis of monitoring wells		$ 9,000
Engineering and Consulting		2,500
	Subtotal	$11,500
	TOTAL O&M	$35,300

10.0 SAMPLING AND ANALYSIS

The sampling and analysis requirements for the CMI phase are discussed in sections 3.0 (Operations and Maintenance) and 8.0 (Monitoring Plan) above. As previously discussed, no additional sampling and analysis is required for the design or construction phase. All of the sampling and analysis prepared in this CMI plan is related to monitoring the performance of the groundwater treatment systems or tracking the effectiveness of the remediation operation.

All sampling and analysis procedures and protocols will be in accordance with those in the RFI work plan. Analytical work will be performed by Reider Laboratories of Reading, PA, which was the lab used for the RFI. All sampling will be performed by personnel from Dixon, INTEX, or Reider.

11.0 DELIVERABLES

The deliverables to be submitted to EPA under the CMI phase will be as follows:

<u>Major Deliverables</u>

Construction Completion Report: This will be submitted upon completion of the groundwater remediation system construction. The report will document consistency of construction with the approved CMI plan as well as documenting any changes to the plan during construction.

Corrective Measure Completion Report: This report will be submitted when a proposal is made to the EPA to shut down the groundwater remediation system and close the site. This report will contain data to support the shut down of the system.

<u>Minor Deliverables</u>

Progress Reports: Periodic progress reports will continue to be submitted as outlined in the original ACO.